DETERMINATION OF PLUTONIUM IN TISSUE USING SURFACE BARRIER DETECTION, MASS SPECTROMETRY, AND LIQUID SCINTILLATION COUNTING

S. H. Reboul[1], J. M. Pochkowski[1], and T. R. LaBone[2]
[1]Environmental Technology Section, SRTC
[2]Health Physics Technology
Westinghouse Savannah River Company
Aiken, SC 29808

ABSTRACT

Analyses were conducted to characterize the plutonium introduced into a worker's body through a puncture wound incurred in a glove box. Tissue from the wound site was radiochemically processed, then analytes were measured using four techniques chosen to provide isotopic determinations of Pu-238, 239, 240, 241, Am-241 and to provide cross-checks for each of the results. Classical alpha pulse height analysis with surface barrier detection was used to quantify Pu-238, Pu-239 + Pu-240, and Am-241; thermal ionization mass spectrometry was used to quantify Pu-239, Pu-240, and Pu-241; photon-electron alpha liquid scintillation (PERALS) counting was used to quantify gross plutonium alpha activity and Am-241; and conventional liquid scintillation counting was used to quantify Pu-241. Results of the four measurement techniques were consistent with one another and indicated that the wound site contained 3.7 ± 0.2 Bq Pu-238, 60.7 ± 1.9 Bq Pu-239, 13.7 ± 0.4 Bq Pu-240, 374 ± 11 Bq Pu-241, and 7.6 ± 0.3 Bq Am-241. Based on the results, the plutonium was characterized as being low burnup grade material with an age of 10.0 ± 1.0 years.